Addressing Nitrate in California's Drinking Water, Tulare Lake Basin and Salinas Valley

Thomas Harter & Jay Lund

Principal Investigators

Jeannie Darby, Graham Fogg, Richard Howitt, Katrina Jessoe, Jim Quinn, Stu Pettygrove, Joshua Viers

Co-Investigators

Aaron King, Allan Hollander, Alison McNally, Anna Fryjoff-Hung, Cathryn Lawrence, Daniel Liptzin, Danielle Dolan, Dylan Boyle, Elena Lopez, Giorgos Kourakos, Holly Canada, Josue Medellin-Azuara, Kristin Dzurella, Kristin Honeycutt, Megan Mayzelle, Mimi Jenkins, Nicole de la Mora, Todd Rosenstock, Vivian Jensen

Researchers

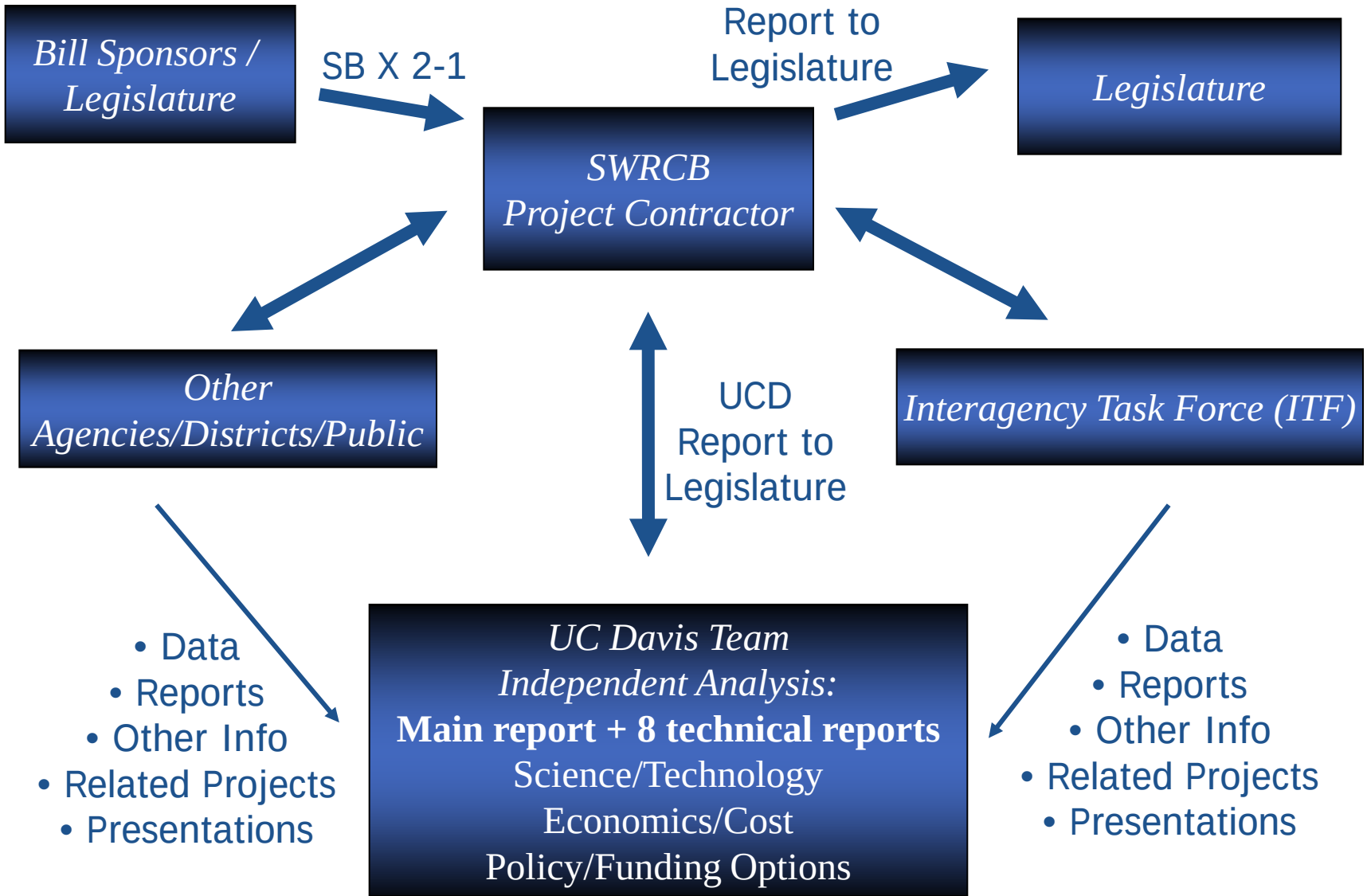
GroundwaterNitrate.ucdavis.edu

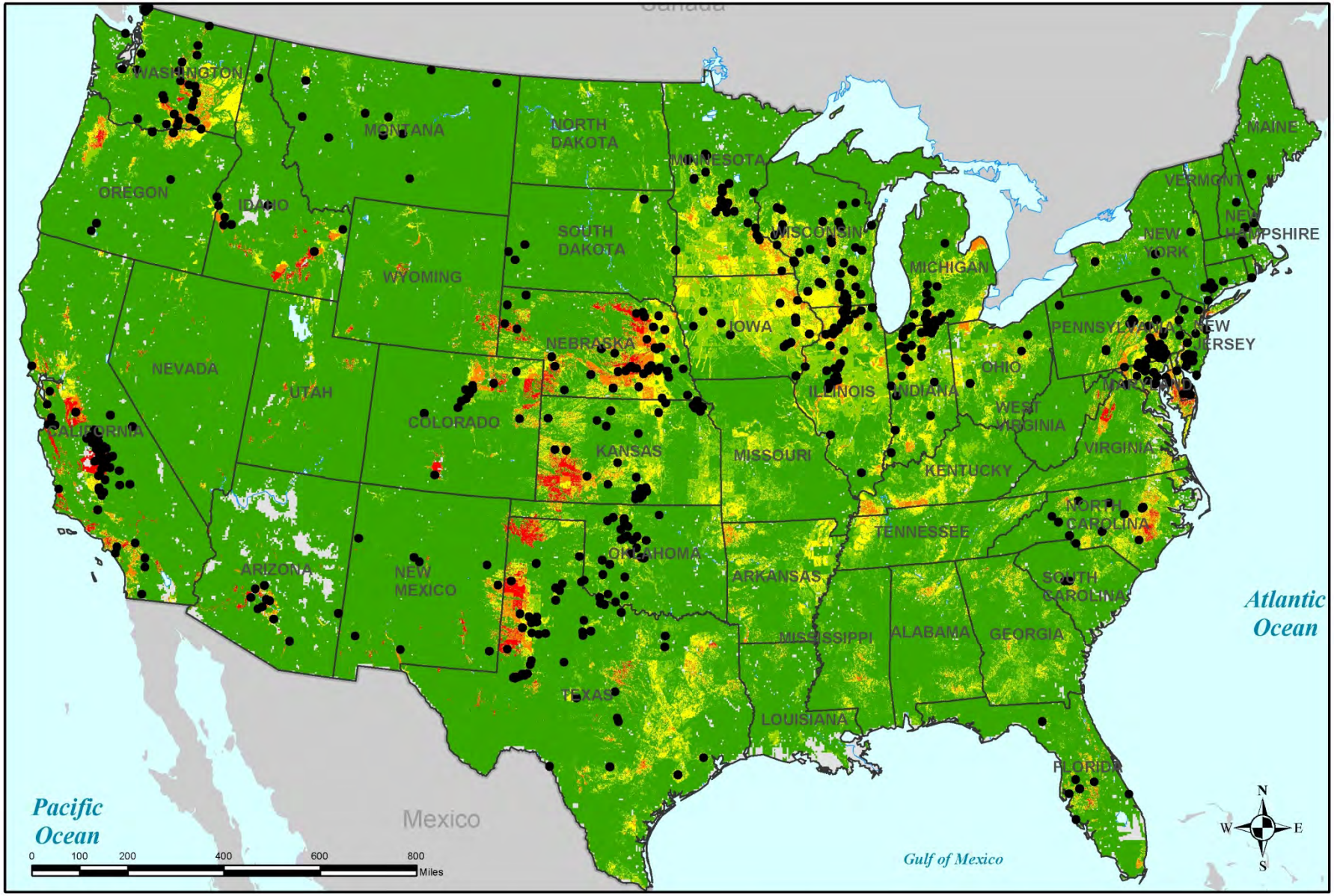
Center for Watershed Sciences

University of California, Davis

Contact: ThHarter@ucdavis.edu

UC Davis Role





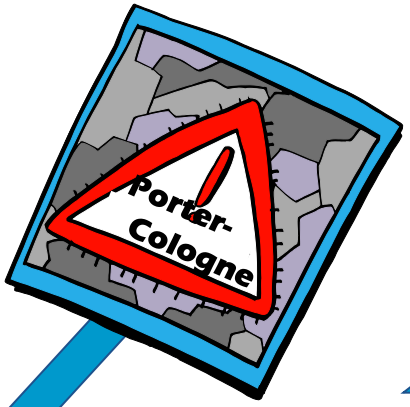
2011 Nitrate MCL Violations (U.S. EPA) & USGS Groundwater Nitrate Model (Nolan & Hitt, 2006)

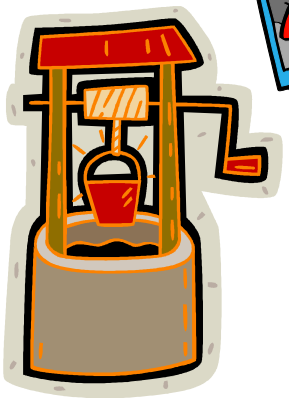
50 m Depth Simulation
mg/L nitrate as N

- 0 - 1.50
- 1.51 - 2.50
- 2.51 - 5.00
- 5.01 - 10.0
- >10
- ●2011 Nitrate MCL Violations (U.S. EPA)

Nitrates in Groundwater in California

N Loading Reductions



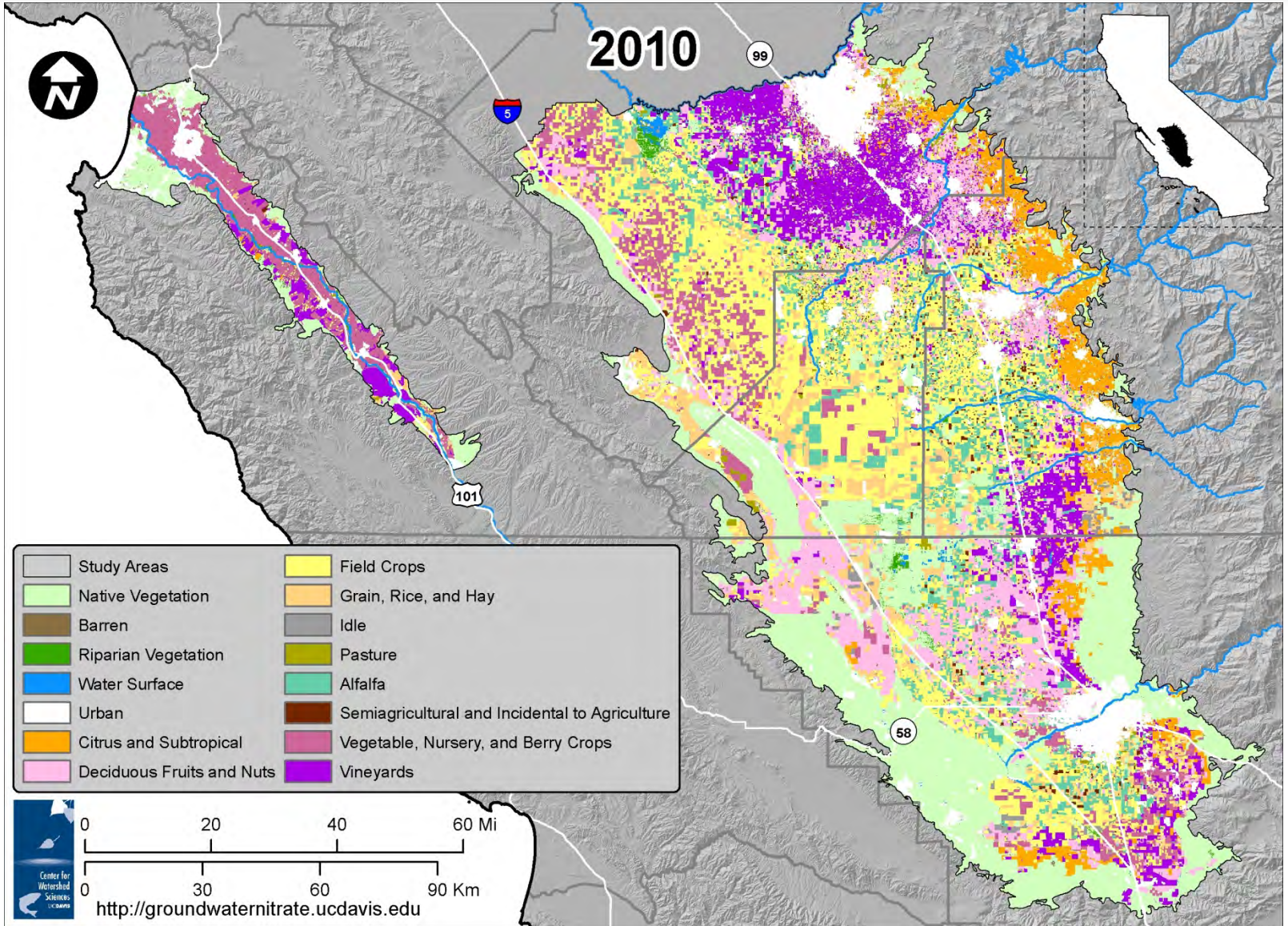


Treatment / Alternative Supply

Decade(s) later

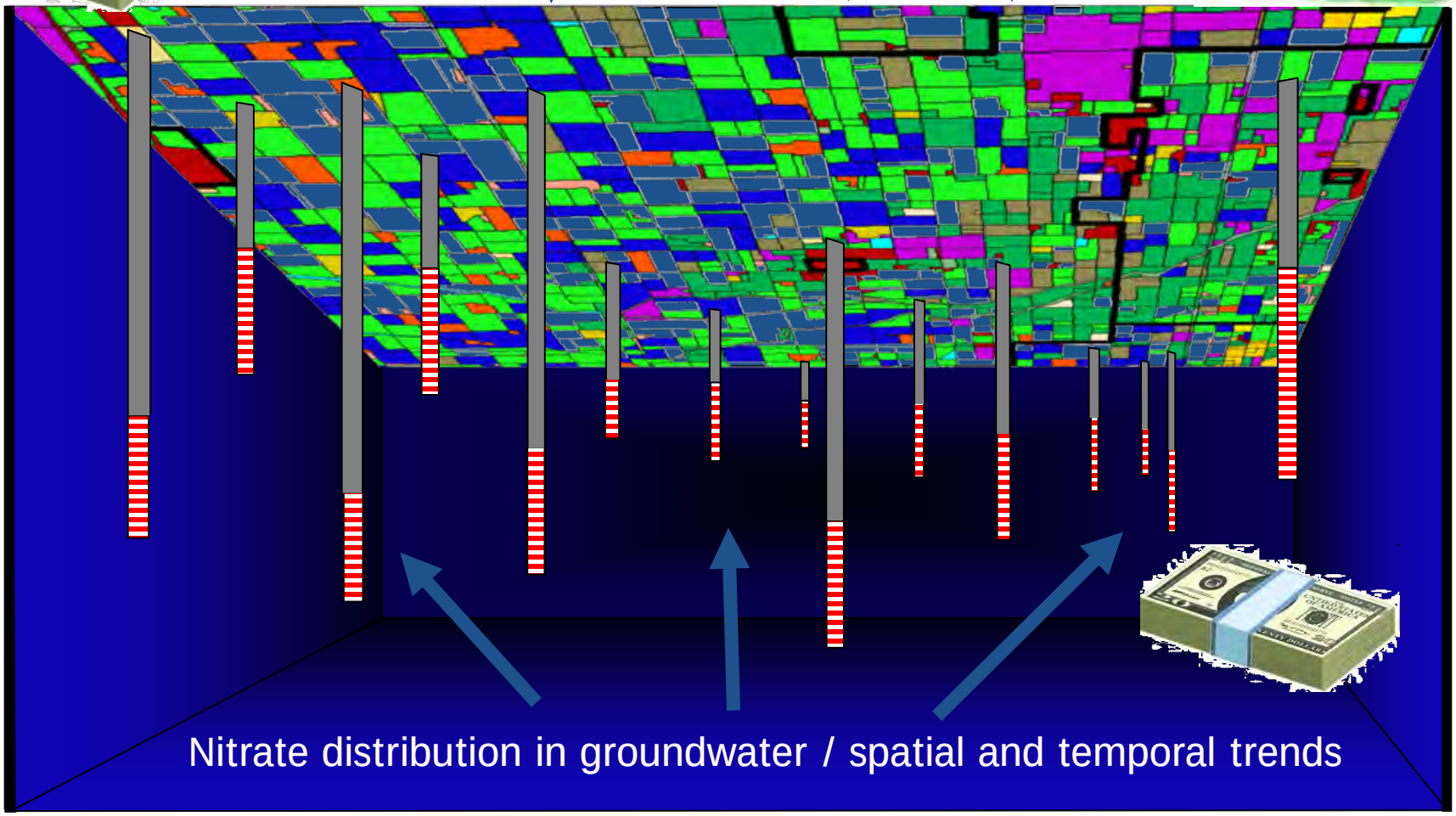
Groundwater Remediation

Nitrate Contamination Study Area



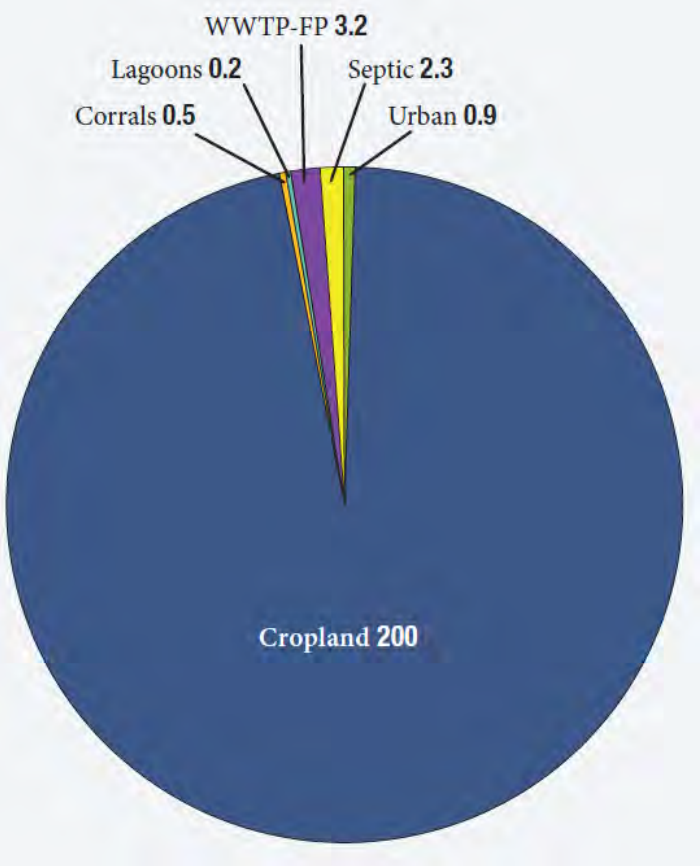
Nitrate in Groundwater

N Loading / Sources and Source Reduction



KEY FINDINGS

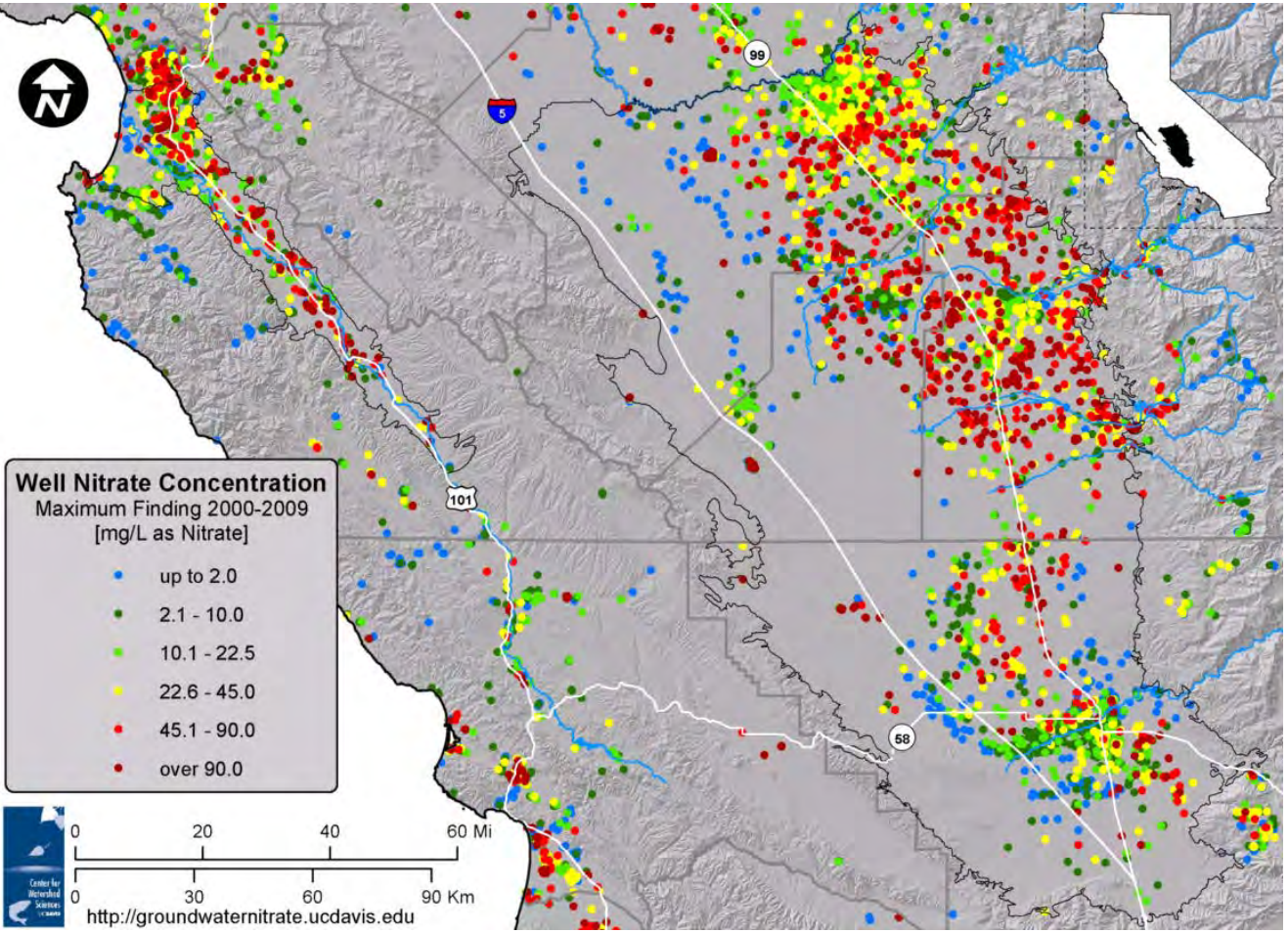
Largest Nitrate Source: Cropland



- Largest cropland nitrogen sources:
  - Synthetic fertilizer
  - Animal manure

- Nitrate loading reductions are possible

Nitrate Contamination Will Persist



- **Nitrate contamination will worsen for years/decades**
- **Direct remediation of groundwater is extremely costly**

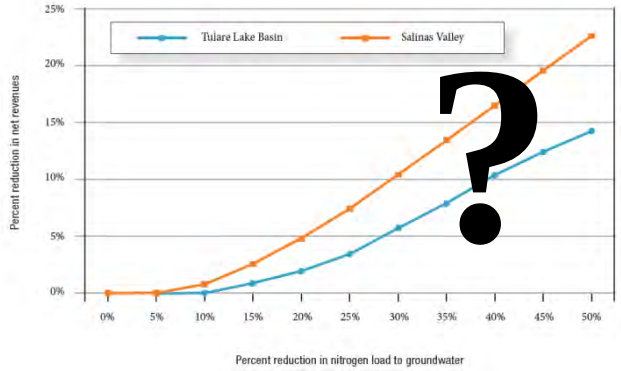
RED: ABOVE THE NITRATE MCL (45 mg/L)
DARK RED: ABOVE TWICE THE NITRATE MCL (90 mg/L)

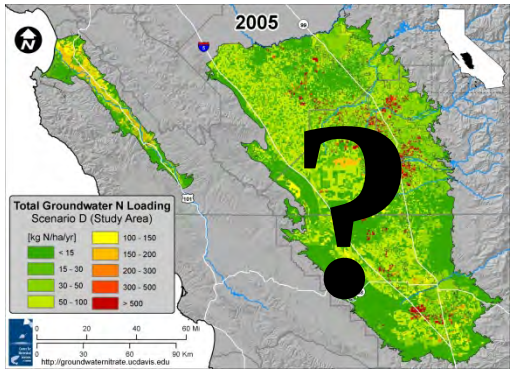
Cost of Safe Drinking Water: $20 - $36 Million / Year (Study Area)

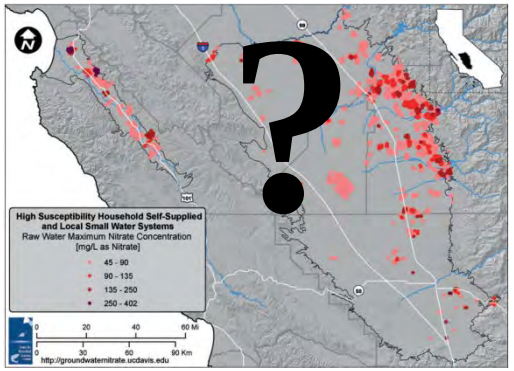
- **Most cost-effective drinking water supply actions:**
  - Blending
  - Treatment (community, point-of-use)
  - Consolidation/regionalization
  - Other alternative supplies
- **Affordability difficult for small communities**
- **Most promising revenue source:**
  - Fee on nitrogen fertilizer use
  - Fee on water use
  - Local compensation under Section 13304 of CA Water Code

Data for Assessing Public Exposure and Nitrate Sources

- More consistent, accessible data needed for efficient implementation
- Agencies not organized to gather data or make effective use of data







Key Take Home Messages

- Safe drinking water is the most pressing issue
  - Challenges: organization and funding
- Nitrate loading can be reduced, long-term
  - Challenges: training, research, investment, compliance, and funding
- State needs to collect and organize data to allow for better assessment
  - Challenges: institutional silos, organization, privacy issues/data security, and funding

Dilemmas for State Policy

1. **Should nitrate dischargers pay for drinking water costs?**
   - If so, how? Statewide nitrogen fee, statewide or regional water fees, regional compensation funds, individual liability lawsuits? Site monitoring is expensive.

2. **Is non-degradation for nitrate a desirable policy?**
   - Source control is not very effective in avoiding drinking water costs
   - Effective source control is expensive

3. **More effective and less costly regulation of environmental effects of land use activities.**
   - Nitrate, salt, water, pesticides, air pollution, … Silo-ed and uncoordinated regulatory framework
   - Poor development and application of environmental information, science, and engineering
   - Costly, and not particularly effective environmentally.

Promising Actions

- See back page of the “Executive Summary”

Action	Safe Drinking Water	Groundwater Degradation	Economic Cost
No Legislation Required			
Safe Drinking Water Actions			
D1: Point-of-Use Treatment Option for Small Systems +	♦♦		low
D2: Small Water Systems Task Force +	♦		low
D3: Regionalization and Consolidation of Small Systems +	♦♦		low
Source Reduction Actions			
S1: Nitrogen/Nitrate Education and Research +		♦♦♦	low–moderate
S2: Nitrogen Accounting Task Force +		♦♦	low
Monitoring and Assessment			
M1: Regional Boards Define Areas at Risk +	♦♦♦	♦♦♦	low
M2: CDPH Monitors At-Risk Population +	♦	♦	low
M3: Implement Nitrogen Use Reporting +		♦♦	low
M4: Groundwater Data Task Force +	♦	♦	low
M5: Groundwater Task Force +	♦	♦	low
Funding			
F1: Nitrogen Fertilizer Mill Fee		♦♦♦	low
F2: Local Compensation Agreements for Water +	♦♦	♦	moderate
New Legislation Required			
D4: Domestic Well Testing *	♦♦		low
D5: Stable Small System Funds	♦		moderate
Non-tax legislation could also strengthen and augment existing authority.			
Fiscal Legislation Required			
Source Reduction			
S3: Fertilizer Excise Fee	♦♦	♦	moderate
S4: Higher Fertilizer Fee in Areas at Risk	♦	♦	moderate
Funding Options			
F3: Fertilizer Excise Fee	♦♦	♦♦	moderate
F4: Water Use Fee	♦♦	♦♦	moderate